Bayesian meta-analysis

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$\Rightarrow$ a single quantitative summary of studies answering the *same research question*

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⚠ potential differences in the pooled experiments

⚠ only aggregated summary statistics estimates ("effect sizes") available – alongside uncertainty (e.g. standard errors)

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Often, different studies used different populations
⇒ potential extra-variability

\+ different sample sizes ⇒ also impact the estimate and its variability

Meta-analysis random effects model

Common approach for meta-analysis:

$$y_i \sim \mathcal{N}(\theta_i, \sigma_i^2)$$

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$\Rightarrow$ between study variability: $y_i \sim \mathcal{N}(\mu, \sigma_i^2 + \tau^2)$

Hierarchical generalization of the fixed effect model:

$$y_i \sim \mathcal{N}(\mu, \sigma_i^2)$$

$\Rightarrow$ assume same average effect for each study

Bayesian meta-analysis in practice

Meta-analysis: a perfect usecase for Bayesian analysis ?

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- few observations
- informative *prior*
- sequential

Going further

Scientific literature search

⚠ FIRST (!) exhaustive search of the scientific literature

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Evidence synthesis

Meta-analysis $\in$ evidence synthesis

e.g. meta-regression, mechanistic modeling, ...

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Still active research domains:

- random effects model will down-weight studies with larger sample sizes – Serghiou & Goodman, *JAMA*, 2018

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  a bug or a feature ?

Your turn !

Read ND Crins *et al.* Interleukin-2 Receptor Antagonists for Pediatric Liver Transplant Recipients: A Systematic Review and Meta-Analysis of Controlled Studies, *Pediatric Transplantation* 18(8):839, 2014. **[DOI:10.1111/petr.12362]**

Practical: exercise 7